features

Environmental Contamination: An Analysis in the Context of the DC Matrix

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abstract

A significant amount of research has been published in professional literature over the past decade addressing environmental contamination. However, we lack an overall pictorial model for organizing this literature and the applicable valuation techniques. This article discusses environmental contamination and much of the more recent body of work within the context of the Detrimental Conditions (DC) Matrix.[1] It also illustrates where accepted valuation methods fall into the overall picture. This is particularly important in evaluating the distinctions between and valuation characteristics of source, non-source, and adjacent-proximal properties (SNAP).

Many appraisers, real estate economists, real estate analysts, and attorneys are familiar with the Detrimental Conditions (DC) Matrix, which outlines the assessment, repair, and ongoing stages of environmental contamination with the cost, use, and risk issues involved. The DC Matrix frames the three stages of analysis and related issues that may warrant consideration for matters involving any environmental or detrimental condition.

The DC Matrix can be very useful in exposing "junk science" appraisals. Some appraisers simply assume that a certain situation has caused a diminution in property value, and then guess the amount of damage. When a prospective buyer is asked, "How would you like to live next to a landfill, power line, contaminated lake, freeway interchange, or some other externality?" the answer is inevitably negative. Nonetheless, the relevant question is how much weight the condition is given by the market, relative to all the other issues considered in a decision to purchase or lease a property. With this approach, it becomes clear that many situations may not have any material impact in the market or that a significant portion of the market would give the situation little weight when considered in relation to all the positive attributes of the property.

In Dr. Mark Dotzour's article, "Groundwater Contamination and Residential Property Values,"[2] he states that it is important to do specific market research:

> This research offers empirical evidence that not all properties within a contaminated site may suffer diminished value, but this research also measures only one market's reaction at one period of time to the specific event in one local community. The market reaction in other areas could be different.[3]

1. Randall Bell, *Real Estate Damages: An Analysis of Detrimental Conditions* (Chicago: Appraisal Institute, 1999): 8–15. Also see Randall Bell, "The Impact of Detrimental Conditions on Property Value," *The Appraisal Journal* (October, 1998): 380–391.
2. Mark Dotzour, "Groundwater Contamination and Residential Property Values," *The Appraisal Journal* (July, 1997): 279–285.
3. Ibid., 283.

Table 1 The DC Matrix

	Assessment	Repair	Ongoing
Cost	• Cost to assess & responsibility • Engineering • Phase I, II, III studies	• Repair costs & responsibility • Repairs • Remediation • Contingencies	• Ongoing costs & responsibility • Operations & maintenance (O&M) • Monitoring
Use	• All loss of utility while assessed • Disruptions • Safety concerns • Use restrictions	• All loss of utility while assessed • Income loss • Expense increase • Use restrictions	• Ongoing disruptions • Material alterations to highest & best use
Risk	• Uncertainty factor • Discount, if any, where extent of damage is unknown	• Project incentive • Financial incentive or risk, if any, during repairs	• Market resistance • Residual discount, if any, due to a historical situation

John Dorchester, Jr. recently asked the question, "Can the ultimate reliability of the valuer's results be demonstrated and supported by credible market evidence?"[4] Richard Roddewig noted that:

> Appraisers must look to the marketplace for answers and analyze what the marketplace itself is actually saying. Scientific conclusions about persistence of contaminants do not necessarily correlate with the marketplace's conclusion about the duration of economic impact on real estate.[5]

One could say that a property is innocent until proven guilty. For a property to be "guilty" of any diminution in value, there must be clear, relevant, and objective market data that meets the test of market value. It must also demonstrate that the market does indeed give the condition enough weight to diminish its value. The DC Matrix not only assists in organizing and completing this research, but it sheds light on the possible reasons for any diminution in value.

SNAP: Source, Non-Source, and Adjacent-Proximal Properties

One of the basic facts relating to contamination and liability under the law is whether a property is a source of a release that poses a risk or merely a non-source or adjacent property onto or into which the contamination has migrated or is merely proximate to.[6] This is a fundamental distinction for contaminated properties, and one that is especially important to liability under CERCLA. It is also an area that confuses many appraisers. They may use, for instance, conclusions based on source property case studies and apply their observations to an adjacent subject property. Without making weighty and overly subjective adjustments to these observations, they are likely to reach egregious conclusions. These properties, therefore, should be considered within the context of a similar DC Matrix format and a specific market data set. The distinction between source and non-source properties has been the basis for claims in many civil matters and is also important for assigning legal liability under other statutes, regulations, and remedial cost options.

Source

The affected area or contamination origin, called a "facility" for Superfund purposes, includes all the air, soils, and waters contaminated by the risk source, and may include any number of legal parcels. In Table 2, the DC Matrix represents the general areas of study.

Table 2 DC Matrix: Source Property

	Assessment	Repair	Ongoing
Cost	Possible	Possible	Possible
Use	Possible	Possible	Possible
Risk	Possible	Possible	Possible

4. John D. Dorchester, Jr., "The Federal Rules of Evidence and *Daubert:* Evaluating Real Property Valuation Witnesses," *The Appraisal Journal* (July, 2000): 306.
5. Richard J. Roddewig, "Temporary Stigma: Lessons from the Exxon Valdez Litigation," *The Appraisal Journal* (January, 1997): 100.
6. Bell, 128–129.

The significance of the DC Matrix, as it relates to the source property, is the entire spectrum of liability. Under the Superfund Law, a source property has strict joint and seperate liabilities for all costs to remediate the entire area affected by the problem. Thus, the appraiser needs to address and consider each of the nine cells for a thorough analysis. However, while each should be considered, not all may necessarily be applicable.

Non-Source

A non-source property may be part of the facility created by the release on the source site. The owner of the non-source property, however, does not generally have liability for the costs of remediation because the contamination comes from an outside source that has no relationship in terms of ownership of the non-source site. There generally are no repair costs to the owner, particularly if the source property is identified and the owner is financially viable. The level of any value diminution at a non-source site is typically less than an otherwise similar source site. Because the owner of a source property is usually responsible for the costs of cleanup and other issues related to environmental liability, the owner of a non-source property is far less involved, and generally is not responsible at this level. There is a major distinction between these two circumstances. The DC Matrix in Table 3 represents possible areas of study.

Table 3 DC Matrix: Non-Source Property

	Assessment	Repair	Ongoing
Cost	Generally none	Generally none	Generally none
Use	Possible	Possible	Possible
Risk	Possible	Possible	Possible

The DC Matrix is useful in identifying areas requiring investigation by the appraiser. If the source property owner has been determined responsible for abatement, accepts such responsibility, and has the sufficient financial resources, it becomes apparent that certain costs associated with the three stages are not applicable.

Adjacent—Proximal

An adjacent property is not a part of the facility, but adjoins either a source or non-source property. It is not directly affected by the release at the facility and generally has no liablity for any part of the remedial process. As with non-source properties, adjacent properties may or may not have a value loss pattern. Proximal properties are not directly adjacent to the source or non-source properties, but are separated from them by other adjacent parcels or natural barriers. They are simply "in the area" but do not abut the contaminated property. Simply stated, adjacent and proximal properties are not contaminated, which again refocuses the relevant study. The DC Matrix in Table 4 represents areas of research.

Table 4 DC Matrix: Adjacent—Proximal Properties

	Assessment	Repair	Ongoing
Cost	Generally none	Generally none	Generally none
Use	Generally none	Generally none	Generally none
Risk	Possible	Possible	Possible

If the source property owner is responsible for the costs associated with the assessment, repair and ongoing stages, has accepted responsibility, and is financially sound, then these issues are most likely not applicable to adjacent or proximal sites. Generally, there are no use issues. However, there may be exceptions like use interruptions before and during remediation. Also, within the ongoing stage, there may be changes in highest and best use or land use restriction of the adjacent subject. Typically the potential risk relates to negative publicity and asserted third-party fears, among others. It is possible that community outrage[7] over the fears of possible illness, offsite migration of contaminants, and loss of property value may translate into risk. Robert Simons found that in Fairfax County, Virginia, adjacent residential property, in proximity to a leaking historical pipeline right of way, might potentially reduce the value of the properties.[8]

While risk is possible in these adjacent-proximal situations, these properties are very distinct from source or non-source properties in that they are not and have never been contaminated by the source property. Accordingly, there are generally no costs or losses of use, which often are components that drive risk.

With the applicability of the nine quadrants of the DC Matrix discussed in the SNAP context, it is useful to examine each of the nine quadrants of the

7. Peter M. Sandman, PhD, *Responding to Community Outrage: Strategies for Effective Risk Communication,* (Fairfax, VA: American Industrial Hygiene Association, 1993).
8. Robert A. Simons, "The Effect of Pipeline Ruptures on Noncontaminated Residential Easement-Holding Property in Fairfax County," *The Appraisal Journal* (July, 1999): 255–263.

matrix in more detail. In fact, all relevant and consequential issues will inevitably fall into one of these nine quadrants.

Assessment Stage

This is the stage before cleanup where the damage is assessed, usually by engineers, contractors or other qualified experts. A significant reduction in the sale price of a property that is not fully characterized, but highly suspect or known to be contaminated is consistent with the increase in risk due to uncertainty about the level of contamination, remediation costs, and future ongoing issues, etc. Michael Sanders relates this uncertainty to geotechnical matters when he said that the greatest diminution in value tends to be immediately after the loss or damage is identified, and before the nature and extent of the difficulty is fully known.[9]

Assessment Costs

Assessment costs are associated with assessing the property and are generally estimated by a qualified consultant—typically an engineer. It is beyond the expertise and ability of most appraisers to determine the nature of the problem and to design an appropriate fix.[10] Therefore, the appraiser will be given this information and will apply costs appropriately to each phase, depending on who is financially responsible. Costs include all of the direct costs, related costs, and contingencies related to each phase. These may have varying degrees of impact on the property's value and on development in terms of possible project delays—many months or years depending on what is found.[11]

Remediation assessment and repair costs are typically handled as a direct capital expenditure when measuring their effect on value. Roddewig[12] discusses in detail the requirements, standard of care, and minimum due diligence that an appraiser should follow in conjunction with the assessment and repair stages of environmentally contaminated real estate and related costs.

> …[appraisers] must rely on the "advice of others" for such information. Most appraisers, therefore, need professional assistance from environmental specialists to complete an appraisal assignment that considers the impact of hazardous substances on value.[13]

Roddewig also notes that appraisers need to review expert's qualifications, read their report, observe any discrepancies between the report and the appraiser's inspections, and ask questions.

The appraiser should not only name these experts and reports in the appraisal report, but also the author and date specifics relied upon. When dealing with inconsistent reports (dueling experts), the appraiser should attempt to reconcile them by doing what the marketplace would do. This includes reviewing the conflicting reports, and if the situation allows it—often in litigation it is inappropriate to talk directly with the experts on the other side—discussing the findings with the various specialists and determining how buyers would discount the price based on the uncertainty of the estimated cleanup costs.[14]

The appraiser can compare the reports as to the level of testing, assumed amount of cleanup, interview agencies, and the amount of property that must be abated. Roddewig also discusses the departure provision of the Uniform Standards of Appraisal Practice and standard disclaimers and suggests a revision to the Appraisal Institute's Guide Note 8.

Assessment Use

Assessment use includes any disruptions to the use of the property during the assessment period due to environmental contamination. During each stage, the utility of the property should be considered, as compared to the use as unimpaired—the baseline or before condition. For instance, a portion of the property may not be accessible or usable during assessment. An example of this is a substantial gasoline leak from a service station. An entire retail area can be shut down as authorities assess the situation and attempt to reclaim any free-floating product. Restrictions on use, increased operating expenses, and business interruption may be legitimate compensation issues for loss of use during this stage.[15]

9. Michael V. Sanders, "Post-Repair Diminution in Value from Geotechnical Problems," *The Appraisal Journal* (January, 1996): 63.
10. Ibid., 60.
11. Robert A. Simons and Arthur Sementelli, "Liquidity Loss and Delayed Transactions with Leaking Underground Storage Tanks," *The Appraisal Journal* (July, 1997): 256.
12. Richard J. Roddewig, "Contaminated Properties and Guide Note 8: Questions, Answers, and Suggestions for Revision," *The Appraisal Journal* (January, 1998): 99–105.
13. Ibid., 100.
14. Ibid., 102.
15. Sanders, 60.

Assessment Risk

Assessment risks are the uncertainties associated with a property that has not been assessed (uncertainty factor). One might expect significant discounts in price at this point in the remediation life cycle.

> In some situations, the market is entirely disrupted and arm's length transactions are nonexistent. Part of this uncertainty comes from lack of information about whether the site can actually be cleaned up, how much it will cost to do so, and who will pay for it.[16]

As more information is gathered and understood, this type of risk diminishes or is eliminated all together.

> The availability of accurate information about the levels of contamination and the costs and duration of control or cleanup can cut down dramatically on the risk associated with ownership of property affected by environmental risk.[17]

Dr. Phillip Mitchell[18] presents a conceptual "expected discounted value" model for estimating damages for a property at the point of discovery of contamination as well as at any point in the trajectory of value. With the application of relevant market data and use of probabilistic analysis, the model yields a percentage loss from the base value for contaminated properties. Given the uncertainty of the assessment stage during initial discovery, Mitchell notes that a property would normally be non-saleable during that time, but more saleable and less discounted during the repair or ongoing stages. As the DC Matrix illustrates, possible reasons that the property could be unmarketable at any price is due not only to the use issues (rental loss), but to the required uncertainty factor, project incentive, possible market resistance (Mitchell's residual stigma), and the difficulty of quantifying these risks before a property is fully characterized. Mitchell points out that most economic damages are incurred from the lack of marketability and loss of rental income during assessment and repair, and not from its post-remediation condition.

Repair Stage

If repairs are required, they take place during this stage, and can involve active or passive remediation, reconstruction, preventative construction measures, and so forth.

Repair Costs

Costs are the most obvious of all nine quadrants in the DC Matrix. These are the costs associated with remediating any contamination. Even if the cost to repair is known, a property may be difficult to sell, even with a discount. The acceptable level of repair is determined by laws and regulations that form "…in essence, a set of environmental building codes that define the 'typical' cost of remediation."[19] This building code often takes the form of an approved and financed Remedial Action Plan (RAP).

Although insurance generally addresses risk issues, it is appropriate to assess insurance as a cost item because it can be a direct out-of-pocket expense. This is true for all three stages of the remediation life cycle. Roddewig discusses using environmental insurance to mitigate risk in all three stages.[20] While addressing uncertainty relating to assessed cleanup costs, he says:

> This can vary widely depending on the level of environmental site assessment that has been completed. However, even at sites that have been thoroughly tested and have firm estimates of cleanup costs, there may still be some risk that remediation will be more expensive than even the best estimate.[21]

Using insurance to cover the uncertainty of environmental assessment and repair is a relatively new, but effective, risk management tool. Roddewig notes that it can be applied to cover estimated cleanup costs and overruns, uncertainty of agency cleanup standards, and offsite migration due to the type of remediation technique used (cleanup cost cap insurance). Other risks insurance can cover include possible litigation over recontamination, property value diminution, and third party health claims.

Since Roddewig's article was published, these policies, as well as natural resource damages (NRD) diminution in value and business interruption (in the form of an endorsement) are becoming more common. The use of a pollution legal liability (PLL) policy to cover unknown contamination beyond the RAP is also becoming an industry standard.

16. Dotzour, 280.
17. Richard J. Roddewig, "Stigma, Environmental Risk and Property Value: 10 Critical Inquiries," *The Appraisal Journal* (October, 1996): 381.
18. Phillip S. Mitchell, "Estimating Economic Damages to Real Property Due to Loss of Marketability, Rentability, and Stigma," *The Appraisal Journal* (April, 2000): 162–170.
19. Albert R. Wilson, "Emerging Approaches to Impaired Property Valuation," *The Appraisal Journal* (April, 1996): 161.
20. Richard J. Roddewig, "Using the Cost of Environmental Insurance to Measure Contaminated Property Stigma," *The Appraisal Journal* (July, 1997): 304–308.
21. Roddewig, 304.

Repair Use

Repair use includes any disruptions to use during any necessary remediation. Use interruption during the repair stage is a common occurrence that may translate into lost utility and or income, as well as possible use restrictions on a portion of the site due to remediation activities. Scott Arens discusses it as follows:

> If work to be completed makes the property unrentable for some period, an additional vacancy factor [repair stage–use issue] will be considered by buyers. For owner occupied properties, alternative rental costs should be considered. Using estimates of construction periods and rental rates, a reasonable…figure can be derived.[22]

Additionally, former industrial facilities may be impacted by certain limitations. Various states place restrictions on the transfer of title unless commitments are made for corrective action work, which can make development infeasible from an exit and timing perspective.[23] Agencies need financial assurance that it will get done. Issues to consider, among others, include the cost of financing a letter of credit or bond and the terms releasing the obligation.[24]

Repair Risk

Repair risks include:

- project incentive for a buyer to purchase a property that is assessed but not yet remediated,
- perceived risk to non-source and adjacent or proximal property owners,
- buyer's contingency or the discount required for taking the risk of remediation cost overruns, and
- risk of delays caused by a lengthened regulatory approval process or an extended repair period.

Arens notes that within this stage, buyers may require an entrepreneurial incentive or a reward for the time, trouble, and risk associated with managing the work.[25]

Depending upon the nature of the contaminant—petroleum fuel products versus more non-petroleum fuel products and the familiarity of the experts with that particular remedial process, project incentive may be nominal or significant:

> …given a specific state of knowledge, there can be a very large spread in the possible costs of remediation, leading to greater risks and uncertainty. Often the risks and uncertainties result in value offsets much greater than the estimated costs of dealing with the facility.[26]

Repair risk may decrease over time as the real estate marketplace becomes more comfortable with its ability to estimate remediation costs for particular types of environmental risks in a variety of settings. Over time, that often means a decrease in risk caused by the uncertainty about remediation techniques and costs.[27] If the property has an approved and financed RAP, it may diminish further.

When the repair cost is transferred to a third party and is no longer the responsibility of the seller or the buyer, there still may be an increment of risk that impacts value. Dr. Alan Reichert's study of homes within the Uniontown, Ohio Superfund site[28] found significant discounts (decreasing with distance from the landfill) in a pre-repaired condition, which was most likely due to many local residents who are skeptical that the onsite remediation plan will ever be implemented.[29] In spite of being able to connect to city water for clean drinking water, there was a significant perceived risk within the repair stage to adjacent and proximal property owners. Risk during the cleanup stage is largely driven by any cost or material impacts on the property.

Ongoing Stage

Historically contaminated real estate may have continuing or aftermath issues. If so, this stage reflects those after-cleanup factors as based upon fact patterns set out in the preceding stages.

Ongoing Costs

Costs for monitoring wells, O&M programs, insurance, and possible third party liability (agency fines, toxic torts from third party suits, etc.) are considered ongoing costs. Varying levels of "cleanliness," as determined by agency oversight (i.e., risk based corrective action programs), impact possible loss in real estate value. However, this may be mitigated by shifting the cost and risk to another party in the form of insurance or indemnification.

22. Scott B. Arens, "The Valuation of Defective Properties: A Common Sense Approach," *The Appraisal Journal* (April, 1997): 144.
23. Brent C. Anderson, "Valuation of Environmentally Impaired Properties," *Natural Resources & Environment* (Fall, 2000): 102–103.
24. Ibid., 103.
25. Arens, 145.
26. A. Wilson, 170.
27. Roddewig (October, 1996), Ibid.
28. Alan Reichert, "The Persistence of Contamination Effects: A Superfund Site Revisited," *The Appraisal Journal* (April, 1999): 126–135.
29. Ibid., 135.

Ongoing Use

Ongoing use is any ongoing alteration to the use or highest and best use of the property. In discussing the impact of use restrictions in the after condition of a remediated parcel, Wilson states:

> An environmental risk may result in a change in the highest and best use. In one case, a site had an unimpaired highest and best use "…for light industrial development" and was valued at $1.75 per square foot. However, because the site was a former municipal solid waste landfill, subsidence and methane gas generation concerns would increase construction costs to achieve this highest and best use so significantly that an altogether different highest and best use would be indicated. The impaired highest and best use was determined to be for "...outdoor storage" and the indicated value was $0.75 per square foot. The difference, $1.00 per square foot, is the cost of a restriction on use resulting from the presence of the environmental risk.[30]

Arens also states:

> When use changes, a significant part of the loss could be attributed to that change, which is an indirect result of the problem. Using these sales to derive stigma will often result in high stigma estimates.[31]

There may be diminution in value, but it is actually a "use" issue and not a "stigma" issue—a distinction the DC Matrix clearly makes.

The level of repair related to risk-based cleanup as set forth in the RAP is a significant influence on highest and best use—i.e., the existing use is inconsistent with the RAP thus changing residential to commercial in the post-remedial condition. This is often a source of litigation. However, if a source property's highest and best use is commercial/retail, but restrictions are placed on uses such as agricultural, residential or daycare facilities ("improbable alternative uses"[32]), based on the required level of remediation, a question arises as to what impact the restriction really has on value.

Ongoing Risk

This quadrant within the DC Matrix is the most misunderstood section and requires extended discussion. Ongoing risk is associated with the after-cleanup period, which is referred to as "market resistance." It is a type of risk that could conceivably exist as a result of a history of contamination, although the property has been cleaned to the level of acceptance of governmental agencies.

Dr. Alan Reichert points out, "… stigma ultimately is a perception problem. Public perceptions are often not logical, and most certainly not easy to reverse."[33] Meanwhile, others note:

> Stigma is defined as the discount resulting from a property's bad reputation from having once been defective. It is the discount that buyers demand in relation to properties with no history of problems.[34]
>
> Stigma is defined as something that detracts from character or reputation. As it relates to real estate, stigma refers to an intangible psychological impact on value or marketability because of increased risk or future uncertainty.[35]
>
> Environmental stigma is "an adverse effect on the market's perception of the value of property containing an environmental risk even after cleanup costs have been expended or considered in estimating value."[36]

Drs. William Kinnard, Jr. and Elaine Worzala[37] identified two typical sources of stigma as "uncertainty and risk of diminished property value"[38] either after required on-site remediation or from proximity to a perceived contaminated off-site source.

Dr. Thomas Jackson[39] focuses on market resistance as it relates to the post-remediation industrial properties in Southern California. He uses the sales comparison approach and its extension, multiple regression analysis, as they relate to source properties, to conclude that the sale price of the contaminated properties is similar to those of the uncontaminated ones. Jackson, in discussing market resistance, notes:

30. A. Wilson, 161.
31. Arens, 146.
32. Donald C. Wilson, "Highest and Best Use: Preservation Use of Environmentally Significant Real Estate," *The Appraisal Journal* (January, 1996): 85.
33. Reichert, 135.
34. Arens, 144.
35. Sanders, 60.
36. Richard J. Roddewig, "Classifying the Level of Risk and Stigma Affecting Contaminated Properties," *The Appraisal Journal* (January, 1999): 99.
37. William N. Kinnard, Jr. and Elaine M. Worzala, "How North American Appraisers Value Contaminated Property and Associated Stigma," *The Appraisal Journal* (July, 1999): 269–279.
38. Ibid., 269.
39. Thomas O. Jackson, "The Effect of Previous Environmental Contamination on Industrial Real Estate Prices," Excerpt from *Papers and Proceedings* (Appraisal Institute Valuation 2000, July 2000): 59–69.

> The effect of these perceived risks has been referred to as stigma, but it would be more accurately characterized more simply as additional investment and lending risk due to the environmental contamination.[40]

Regarding the sales comparison approach, he states:

> The most significant variable to be considered is the remediation status of the property. That is, the comparable property's environmental condition would be similar in terms of remediation status (before [assessment stage], during [repair stage] or after cleanup at time of sale [ongoing stage]).[41]

This statement addresses the idea that when there is more uncertainty there is more risk. Within the statistical analysis Jackson states:

> The variable of greatest interest to the main research question is the environmental condition of the property as of the date of the sale.[42]

The appraiser must determine where the subject property falls in the DC Model and then use consistent market data in the analysis.

Jackson goes on to focus this method using only source properties within a post-remediation, ongoing condition and concludes that they do not significantly differ in sale price as compared with other uncontaminated industrial properties. This is consistent with the findings of others.[43]

In another article by Jackson, he states that risk quantification involves the complexities of measuring the perceptions of market participants.[44] In an earlier article Jackson and Dr. James A. Chalmer focus on lender and investor expectations as indicated by the overall capitalization rate.[45] Typically, the greater the uncertainty, the higher the necessary return, the lower the value, and the larger the diminution in value due to contamination.[46] Jackson notes:

> …environmental factors must be reviewed on a property-specific basis. [This includes] levels of characterization of the contamination; the regulatory status of the site, costs, and length of the remediation effort; approvals and financing of remediation plan; effects on the use of the property during remediation; the availability of indemnification by financially sound responsible parties; and any post closure property use restrictions.[47]

Due to a potential gradual lessening of the stigma, market resistance may be either long term or short term. A recent study showed that a variety of properties with asbestos did not have any market resistance.[48] Sanders discusses temporary risk:

> Some might argue that if a residual loss or stigma will eventually disappear, then such loss should be viewed as temporary and therefore not compensable…market value (and diminution thereof) is measured at a specific point in time. The fact that a real loss has occurred is more important than the speculative presumption that the owner may eventually recover the full value of the property (i.e., a property sold before the end of an anticipated recovery period will realize a loss in value, notwithstanding the fact that residual stigma may cease to affect value at some time in the future).[49]

Market resistance may be controlled, eliminated, or transferred to others with financial mechanisms such as indemnification, environmental insurance, personal or corporate guarantees, and value assurance programs (VAPs), among others.

A VAP, also known as a value protection program (VPP), is a proactive plan to mitigate a property owner's anxiety over possible loss in value due to a detrimental condition. William Ruskin, Esq., defined a VAP as a contract that may provide a promise that, over time, the homeowner will be made whole if he sells his home. It includes incentives to current owners and/or potential owners to increase the appeal of living in the affected community.[50]

The application of a VAP is very dependent upon whether environmental contamination has caused or may cause real estate values to drop, or whether there has been a significant disruption in a development. An entity may consider its use if it perceives significant cost savings compared to the potential cost of an aggressive lawsuit.

40. Ibid., 201.
41. Ibid., 204.
42. Ibid., 209.
43. Richard A. Neustein and Randall Bell, "Diminishing Diminution–A Trend in Environmental Stigma," *Environmental Claims Journal* (11:1, 1998): 47–59.
44. Thomas O. Jackson, "Mortgage-Equity Analysis in Contaminated Property Valuation," *The Appraisal Journal* (January, 1998): 46.
45. James A. Chalmers and Thomas O. Jackson, "Risk Factors in the Appraisal of Contaminated Property," *The Appraisal Journal* (January, 1996): 44–58.
46. Jackson, 47.
47. Ibid., 48.
48. Roddewig, 97.
49. Sanders, 64.
50. William Ruskin, "The Use of 'Principled Negotiation' in Resolving Environmental Disputes," *American Journal of Trial Advocacy* (Summer, 1993): 225–244.

According to David Strong, Kodak developed and implemented the Kodak Value Protection Program in 1988.[51] The program was in response to possible contamination to the subsurface soils and groundwater beneath its headquarters in Rochester, New York.

The Kodak site was immediately adjacent to a middle-class residential subdivision. Kodak responded to the community's outrage—fear of possible illness and loss of property value—with the implementation of "principled negotiations"[52] and a VAP. The initial priority was to open lines of communication within the community with a neighborhood information center. Kodak identified a variety of significant issues and, after determining that the contamination posed minimal health risks, worked to educate the community. Responding to the neighborhood's fear of a possible loss in value to their biggest investement—their homes—Kodak identified approximately 710 homeowners who were eligible for benefits based on their homes' proximity to the source property. The VAP set forth six areas of assistance:

- Guarantees against loss of property value
- Low-interest mortgage subsidies
- Below-market financing for new buyers
- Grants and low-interest home improvement loans
- Relocation expenses for homeowners choosing to move
- Rent concessions

This VAP was very successful in appeasing the community, maintaining goodwill and corporate reputation, stabilizing property values, and avoiding a large lawsuit. These cost savings were perceived by Kodak to be significant.

While insurance has previously been discussed, it may also be a risk transfer mechanism for mitigating uncertainty within the lender's portion of the mortgage-equity analysis.

> Although the 1996 amendments to CERCLAS, see 42 U.S.C. § 9601(20)(f), went a long way toward resolving the lender liability issues related to contaminated property, many lenders are still nervous about financing a transaction involving impaired property. For that reason, several insurers offer secured creditor insurance policies designed to protect the lender from environmental liabilities that may arise during loan workout and property disposition in the event of a foreclosure or default of the loan.[53]

Damage Valuation Methodologies

The book, *Real Estate Damages,* sets forth the fundamental detrimental condition valuation methodologies. Kinnard and Worzala in their article also summarize valuation techniques for environmentally impacted real estate and compared this with approaches by appraisers.[54] Generally, the accepted methodologies fall under the cost, sales comparison, or income approaches.

The cost approach adds up the "costs" and then deducts them from the baseline to arrive at the impaired value. Like most conventional appraisals, this is usually not the primary approach. The sales comparison approach typically includes techniques such as pairing, case studies, and regression analysis, which support a percent deduction to the unimpaired subject value. Finally, the income approach may be applied by isolating variances in income, vacancy and expenses, and by adjusting the rate of return (risk) to estimate the impaired present worth as compared with the baseline value.

With income-producing properties, Jackson applies the Ellwood procedure and a modified DCF analysis.

> Appropriate risk adjustments, derived through surveys of investors and lenders with respect to the environmental history of the property under study or through extraction from sales of comparable contaminated properties, are input into the mortgage-equity model. This results in an adjusted set of income and yield capitalization rates, which reflect the contamination-related risks, and can be used to estimate the value of the property and its value diminution from an unimpaired baseline condition.[55]

This is a reasonable technique for measuring diminution as a change within the components that make up the overall capitalization rate. Jackson's study visually shows how varying the loan to value ratio and increasing the equity yield rate results in a range of property value diminution. However, ad-

51. David Strong, "Value Assurance Program Symposium," The University Club, PricewaterhouseCoopers, New York, April 1999, author's notes. Strong is Eastman Kodak's manager for Neighborhood Relations for Rochester Area Operations since 1988 and a member of the original Kodak VAP team.
52. Roger Fisher and William Ury, *Getting To Yes: Negotiating Agreement Without Giving In,* 2nd ed., (58, Bruce Patton ed., 1991).
53. Anna Amarandos and Diana Strauss, "Environmental Insurance as a Risk Management Tool," *Natural Resources & Environment* (Fall, 2000): 90.
54. Kinnard and Worzala, 269–279.
55. Jackson, 55.

ditional data relating to vertical risk (i.e., changes in rent, vacancy, or expenses) would have to be included by the appraiser in calculating the related NOI.

Roddewig offers another practical approach to deriving a portion of market resistance for a property.[56] He suggests using actual insurance broker quotes for the subject and researching insurance case studies. However, Roddewig warns that there may be additional market resistance that should be analyzed using environmental case studies.

Statistical surveys and questionnaire surveys are also tools that can be used to estimate market resistance. Statistics can be defined as "the science of collecting, classifying, presenting, and interpreting numerical data."[57] Although statistical surveys are not the primary methodology used in the appraisal profession, they can be valid. Roddewig gaves insight into the appropriate way to conduct a statistical survey, which generally, but not always, includes making the survey the secondary support for the conclusion.[58] Surveys should present questions in an objective and unbiased manner, including enough information to assist the respondent in making a sound response.

> Surveys may have a limited role in some types of assignments involving contaminated property, but collection and analysis of sales and market data will remain the central technique for estimating the stigma impact, if any, that attaches to real property affected by contamination or other forms of environmental risk.[59]

Roddewigs set forth the seminal federal court case, *Zippo Mfg. Co. v. Rogers Imports, Inc.,*[60] for conducting statistical surveys. In general, the trustworthiness of statistical surveys includes evidence that the universe is properly defined and a representative sample is selected. The questions should be clear and not leading. The interviewers need to be competent and follow sound procedures. The information must be accurately reported, the data must be analyzed according to acceptable statistical principles, and the objectivity of the process must be assured.

Conclusion

The DC Matrix is a helpful and practical tool for organizing the myriad of issues that accompany an analysis of environmentally damaged real estate. By focusing on one quadrant at a time, a clearer analysis comes into focus. Further, the DC Matrix is helpful in dismissing the arguments of a grand diminution-in-value proposal that is based more on emotions than a supportable real estate analysis. Additionally, the DC Matrix clears up the often-confusing subject of stigma. The DC Matrix labels *stigma* more accurately as *risk,* which is then delineated into three types of risk depending upon where the contaminated property falls within the remediation life cycle.

Assessment risk, or an uncertainty factor, is normally eliminated upon the assessment of the environmental damage. The repair risk, or project incentive, includes the buyer's contingency, or the discount required for taking the risk of delay and possible cost overruns along with a reward for the time, trouble, and risk associated with managing the remediation. It may also include the perceived risk to neighboring properties that are not contaminated. The ongoing risk, or market resistance, includes ongoing perceptions following completion of remediation. However, by applying risk transfer mechanisms such as environmental insurance and indemnification, or reaching milestones such as the NFA letter, this type of risk may be greatly reduced or eliminated.

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56. Roddewig, 307–308.

57. Johnson, Robert Russell, *Elementary Statistics* 4th Ed, (Boston: Duxbury Press, 1984).

58. Richard J. Roddewig, "Junk Science, Environmental Stigma, Market Surveys, and Proper Appraisal Methodology: Recent Lessons from the Litigation Trenches," *The Appraisal Journal* (October, 1999): 447–453.

59. Ibid., 452.

60. Ibid., 452.

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